

# APPENDIX E.

## TRAIL CONSTRUCTION CRITERIA

## BACK COUNTRY AND PRIMITIVE TRAIL DESIGN INFORMATION

### HIKING TRAILS

	Easiest	More Difficult	Most Difficult 1/
<b>Grade</b>			
Max. Pitch Grade	20%	30%	+30%
Length	100'	300'	500'
<b>Clearing 2/</b>			
Width	48"	36" to 48"	36"
Height	8'	8'	8'
<b>Tread 3/</b>			
Width	18" to 24" Obstacle-free	12" to 18" If needed, depending on volume and drainage.	12"
Surface	Spot gravel surfacing.	Not surfaced-- leave roots, imbedded rocks, and some logs.	No graded tread except on side slopes over 50% where safety or resource damage is a problem.

1/ Upper limit of grade and pitch length for most difficult trails depends on soil type, amount of rock, vegetation type, and other conditions affecting stability of the trail surface.

2/ Curve alignment to avoid cutting large trees.

3/ Increase tread width 6 inches on switchbacks or where side slopes exceed 60 percent.

## MOUNTAIN BICYCLE TRAILS

	<u>Easiest</u>	<u>More Difficult</u>	<u>Most Difficult</u> <sup>1/</sup>
<b>Grade</b>			
Max. Pitch	10%	30%	+30%
Max. Sustained Pitch	5%	10%	15%
Length	100'	300'	500'
Turning Radius	6'	3'	2'
<b>Length of Trip</b>			
Day	10-20 mi	20-40 mi	40-50 mi
One-half Day	5-10 mi	15-20 mi	20-25 mi
<b>Clearing</b> <sup>2/</sup>			
Width	48"+	36"-48"	36"
Height	8'	8'	Max. 8'
<b>Tread</b> <sup>3/</sup>			
Width	24"+	12"-24"	12"
Surface	Relatively smooth	Sections of relatively rough surface	Varied--Some portage required

1/ Upper limit of grade and pitch length depends on soil type, amount of rock, vegetation type, and other conditions affecting stability of the trail surface.

2/ Curve alignment to avoid cutting large trees.

3/ Increase tread width 6 inches on switchbacks or where side slopes exceed 60 percent.

## EQUESTRIAN TRAILS

	<u>Easiest</u>	<u>More Difficult</u>	<u>Most</u>
<b>Difficult 1/</b>			
<b>Grade</b>			
Max. Pitch			
Grade	15%	25%	+30%
Length	200'	300'	500'
<b>Clearing 2/</b>			
Width	8'; 6' between large trees. Pack clearance must be 3' from a point 30" above grade of tread.	6' Pack clearance must be 3' from a point 30" above a grade of tread.	3' to 4' wide
Height	10'	8'	Maximum 8'
<b>Tread 3/</b>			
Width	24"	24"	18"
Surface	Surfacing as needed for stability. Reinforce cross drains with logs or rocks on steep gradients (greater than 10%). Special emphasis on puncheon or turnpikes in bog holes. Construct extra trailbed width in steep terrain.	Leave roots and imbedded rocks. Cross drains permanent with natural roots, rocks, or imbedded logs.	Not graded except on side slopes greater than 30%.

1/ Assume pack animals normally are not accommodated on most difficult trails, so less clearing width is needed. Same holds true for day-use horse trails. The upper limit for most difficult saddle animal trails depends on the soil type, amount of rock, vegetation types, and other conditions affecting stability of the trail surface. The skill of the rider and the condition of the animal also are important considerations.

2/ Along a precipice or hazardous area, the trail clearing width should be at least 48 to 60 inches to provide safety to the riders and their animals.

3/ Increase tread width 12 inches on switchbacks. Tread width on special sections, such as fords or turnpikes, should be at least 36 inches.

## CROSS-COUNTRY SKI TRAILS

	<u>Easiest 1/</u>	<u>More Difficult 1/</u>	<u>Most Difficult 1/</u>
<b>Greatest Single Climb</b> (elevation gain of single continuous climb)	35'	70'	140'
<b>Elevation Differ- ential</b> (lowest to highest point on trail)	100'	250'	500'
<b>Total Climb</b> (sum of all elevation gains)	150'	400'	650'
<b>Greatest Sustained Gradient</b> (over 300' trail distance)	7.5%	12%	17%
<b>Greatest Short Gradient</b> (under 100' trail distance)	10%	20%	--

1/ Based on a 3-mile loop. These are maximum guides for smooth, wide, straight trails with good outruns. Correlate grade with distance to avoid excessive speed buildup.

## ATV TRAILS

	Easiest	More Difficult	Most Difficult
<b>Grade</b>			
Max. Sustained	15%	25%	35%
Length	200'	300'	500'
Max. Pitch	20%	30%	50%

### Clearance (1-Way Traffic)

<b>Wooded</b>			
Downhill side	2'	1.5'	1.0'
Uphill side	3'	3'	3'
Level	3.1' each side	2.6' each side	2.5' each side
<b>Open</b>			
Downhill side	2'	1.5'	1.0'
Uphill side	3'	3'	3'
Level	3.1' each side	2.6' each side	2.4' each side
<b>Height</b>	6'	6'	5'

### Tread Width

Minimum	6.2'	5.2'	4.8'
Maximum	7.2'	6.2'	5.8'

<b>Surface</b>	Relatively smooth, no roots or rocks protruding more than 3", tread plane flat, sweeping curves, no holes wider than 24" nor deeper than 6", loose sand OK	Section of relatively rough surface, no roots or rocks protruding more than 3", tread plane can be insloped 5% max, climbing turns	Relatively rough w/very rough short sections, no protruding rocks 3", tread plane can be insloped or out-sloped
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<b>Obstacles</b> <sup>2/</sup>	Wet xings 6" deep, 10' long max, draindips OK, no waterbars	Wet xings 10" deep, 25' long, waterbars downhill OK	Same as more difficult except waterbars may go uphill & down
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### Exposure (Sideslope)

	0% to 20%	20% to 30%	30% to 40%
Length	Less than 300'	300' to 500'	More than 500'

<b>Traffic Flow</b>	One-way, or two-way w turnouts	One-way, or two-way w turnouts	One-way, or two-way w turnouts
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### Length of Trip

One-half day	3 miles	10 miles	15 miles
Full day	6 miles	20 miles	30 miles

- 1/ Increase tread width 6 inches on switchbacks or where side slopes exceed 30 percent.
- 2/ Avoid any type of sharp peaks in vertical alignment.

## OFF-HIGHWAY MOTORCYCLE TRAILS

	<u>Easiest</u>	<u>More Difficult</u>	<u>Most Difficult 1/</u>
<b>Grade</b>			
Max. Pitch	15%	30%	50%
<b>Clearing</b>			
Width			
Wooded			
Downhill Side	2'	1-1/2'	1-1/2'
Uphill Side	3'	3'	3'
Level	1-1/2' each side	1-1/2' each side	1-1/2' each side
Open			
Downhill Side	2'	1-1/2'	1-1/2'
Uphill Side	3'	3'	2-1/2'
Level	2'	2' each side	1-1/2' each side
Height	8'	8'	8'
<b>Tread</b>			
Width			
Minimum	18" 2/	18"	12"
Maximum	30"	24"	24"
Surface	Relatively smooth throughout, no roots or rocks protruding more than 3". Avoid sand and loose materials.	Sections of relatively rough surface, some loose material such as sand.	Relatively rough with very rough short sections. Long stretches of loose rock, sand, and mud desirable where available.
<b>Obstacles (optional)</b>	None	1 to 5 small logs (up to 6" in diameter) per mile on flat terrain.	1 to 5 logs (up to 6" in diameter) per mile lying on flat terrain.
<b>Turns</b>			
Per 1/4 Mile	2	6	11

1/ Upper limit of grade and pitch length for most difficult trails depends on soil type, amount of rock, vegetation type, and other conditions affecting stability of the trail surface.

2/ Increase tread width 6 inches on switchbacks or where side slopes exceed 50 percent.

## SNOWMOBILE TRAILS

	<u>Easiest</u>	<u>More Difficult</u>	<u>Most Difficult</u>
<b>Length of Trip</b>			
Full Day	30 - 50 mi.	50 - 75 mi.	75 - 100 mi.
Half Day	15 - 25 mi.	25 - 40 mi.	40 - 50 mi.
<b>Grade</b>			
Max. Sustained	8%	--	15%
Max. Pitch	25%	--	35%
<b>Clearing Width</b>			
One-Way	12'	--	9'
Two-Way	16'	--	14'
<b>Clearing Height</b> Minimum 7' above normal maximum snow depth or 10' above ground, whichever is greater (measured to snow-loaded branches).			
<b>Groomed Width</b>			
One-Way	8'	--	5'
Two-Way	12'	--	10'
<b>Turning Radius</b>		25'	
<b>Surface</b>		Minimum: 4" of snow.	
<b>Cross slope</b>			
Maximum for over 50'	15%	30%	40%



## 4X4 TRUCK ROUTES

	<u>Easiest 1/</u>	<u>More Difficult 2/</u>	<u>Most Difficult</u>
<b>Grade</b>			
<b>Max. Sustained</b> (200-300)	20%	20%	30%
<b>Max. Pitch</b>	20%	30%	50%
<b>Clearance</b>			
<b>Width</b>	Ample clearance for logging truck.	12.5'	8'
<b>Height</b>	Ample clearance For logging truck.	9'	8'
<b>Travel Way</b>			
<b>Width</b>	10'	5.0' for 70" Vehicle width	5.0' for 70" vehicle width
<b>Surface</b>	Rough, irregular. Travel w low Clearance difficult	Some sections are rough, large rocks, mud loose materials,	Rough to very rocks, mud, winching area
<b>Obstacles</b>	None	1 to 5 small logs (up to 6" diameter) per mile on flat terrain	1 to 5 logs (up to 10" 10" diameter) per mile, large rocks
<b>Flow</b>	Two-way traffic difficult and require backing to pass	Two lock-to-lock turns within 150'	Five lock-to-lock turns within 150'
<b>Travel Way</b> <b>Plain</b> (outslope)	Level only as necessary for drainage.	20%	30%
<b>Average</b> <b>Speed</b>	Some slow-speed sections	4-10 mph	2-4 mph
<b>Length of</b> <b>Day Trip</b>	30 to 40 miles	10 to 15 miles	10 miles

1/ Easiest trails usually are built for other purposes.

2/ Most difficult for long-wheelbase vehicles. Short-wheelbase vehicles have maximum hub-to-hub length of 100 inches (for example, Blazers, CJ4's, and Jeeps, which have a 90-inch length).